# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/073,215 | 02/13/2002 | Masato Hagiwara | 57454-335 | 4811 |

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| 7590 12/02/2004 | | EXAMINER |
| McDERMOTT, WILL & EMERY | | ROCHE, TRENTON J |
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| ART UNIT | PAPER NUMBER |
|---|---|
| 2124 | |

Washington, DC 20005-3096

DATE MAILED: 12/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | Application No. | Applicant(s) |
| --- | --- | --- |
| **Office Action Summary** | 10/073,215 | HAGIWARA ET AL. |
| | Examiner | Art Unit |
| | Trent J Roche | 2124 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE **3** MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)☒ Responsive to communication(s) filed on *13 February 2002*.

2a)☐ This action is **FINAL**.    2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

## Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All    b)☐ Some *    c)☐ None of:

        1.☒ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____.

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date *02132002*.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

# DETAILED ACTION

1.      This office action is responsive to communications filed 13 February 2002.

2.      Claims 1-17 have been examined.


## *Claim Rejections - 35 USC § 102*

3.      The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.      Claims 1, 2, 4-12, 14, 15 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by

U.S. Patent 5,794,049 to Lindholm.


**Per claim 1:**

Lindholm discloses:

-   a program execution device of executing a program described in a prescribed language (Note

    Figure 2 and the corresponding sections of the disclosure)

-   a compressed code storing portion storing a code of said program compressed on a

    prescribed unit basis ("the code compressor stores in the secondary memory the

    compressed...code..." in col. 4 lines 1-3)

-   an expanding portion connected to said compressed code storing portion for expanding said

    compressed code stored in said compressed code storing portion ("the code compressor

    compresses and decompresses in the RAM the code of the methods..." in col. 6 lines 17-19)

- a code storing portion connected to said expanding portion for storing the code expanded

    by said expanding portion ("the code compressor compresses and decompresses in the

    RAM the code of the methods..." in col. 6 lines 17-19)

- an interpreter portion connected to said code storing portion for interpreting said expanded

    code for execution ("the executer interprets the AN code of the methods for execution..."

    in col. 6 lines 6-7)

substantially as claimed.


**Per claim 2:**

The rejection of claim 1 is incorporated, and further, Lindholm discloses an object oriented language

("programmed in an object-oriented manner" in col. 5 lines 6-7) and the prescribed unit bases being

a method as claimed (Note Figure 3, item 316 and the corresponding sections of the disclosure)


**Per claim 4:**

The rejection of claim 1 is incorporated, and further, Lindholm discloses the prescribed unit being

an instruction as claimed (Note the rejection of claim 2, methods are instructions.)


**Per claim 5:**

The rejection of claim 1 is incorporated, and further, Lindholm discloses a compression mode

determining portion as claimed (Note Figure 4, item 410 and the corresponding sections of the

disclosure. For the system to decompress the method, it must have a compression mode

determining portion, so that it can determine how to decompress the compressed data.)

**Per claim 6:**

Lindholm discloses:

- a program execution device of executing a program described in an object oriented language, said program being described in a code other than a code native to said program execution device (Note Figure 2 and the corresponding sections of the disclosure. Further, "these programs are written in the Java programming language...in an object-oriented manner" in col. 5 lines 2-7)

- a compressed code storing portion storing a code of said program compressed on a method basis ("the code compressor stores in the secondary memory the compressed...code..." in col. 4 lines 1-3. Further, note Figure 3, item 316 and the corresponding sections of the disclosure )

- an expanding portion connected to said compressed code storing portion for expanding said compressed code ("the code compressor compresses and decompresses in the RAM the code of the methods..." in col. 6 lines 17-19)

- a converting portion connected to said expanding portion for converting said expanded code to a native code (Note Figure 3, item 308 and the corresponding sections of the disclosure)

- a native code storing portion connected to said converting portion for storing the native code output from said converting portion ("the code compressor compresses and decompresses in the RAM the code of the methods..." in col. 6 lines 17-19. Further, note Figure 3, item 318 and the corresponding sections of the disclosure)

- a native code executing portion connected to said native code storing portion for executing said native code (Note Figure 4, item 406 and the corresponding sections of the disclosure)

substantially as claimed.

**Per claim 7:**

The rejection of claim 6 is incorporated, and further, Lindholm discloses a native code storing

portion being a cache memory as claimed ("the generated AS code could be cached in the run-time

memory…" in col. 2 lines 56-57)


**Per claim 8:**

Lindholm discloses:

- a program execution device of executing a program described in an object oriented language,

  (Note Figure 2 and the corresponding sections of the disclosure. Further, "these programs

  are written in the Java programming language…in an object-oriented manner" in col. 5 lines

  2-7)

- a code storing portion storing a code of a method of said program ("the code compressor

  stores in the secondary memory the compressed…code…" in col. 4 lines 1-3. Further, note

  Figure 3, item 316 and the corresponding sections of the disclosure )

- a native code storing portion storing a native code of the method (Note Figure 3, item 318

  and the corresponding sections of the disclosure)

- a compressed native code storing portion storing a compressed native code obtained by

  compressing the native code of the method (Note Figure 3, item 318 and the corresponding

  sections of the disclosure)

- a first determining portion connected to said native code storing portion for determining if a

  native code of a desired method is stored in said native code storing portion; a second

  determining portion connected to said compressed native code storing portion for

determining if a compressed native code of said desired method is stored in said compressed

native code storing portion (Note Figure 4, item 404 and the corresponding sections of the

disclosure. Determinations must inherently be made to determine that AS code is present,

and further checking is utilized to determine that the AS code is compressed.)

- a native code storage controlling portion connected to said first and second determining

portions, said compressed native code storing portion, said code storing portion and said

native code storing portion for selectively executing expansion of the compressed native

code stored in said compressed native code storing portion or conversion of the code stored

in said code storing portion to a native code and storing the resultant native code to said

native code storing portion in accordance with outputs from said first and second

determining portions (Note Figures 3 and 4 and the corresponding sections of the

disclosure.)

- a native code executing portion connected to said native code storing portion for executing

the native code stored in said native code storing portion (Note Figure 4, item 406 and the

corresponding sections of the disclosure)

- a native code compressing and storing portion connected to said second determining

portion, said native code storing portion and said compressed native code storing portion

for compressing the executed native code and storing it in said compressed native code

storing portion in accordance with the output from said second determining portion (Note

at least Figure 3, items 318. A determination inherently occurs so as to not re-compress

already compressed code.)

substantially as claimed.

**Per claim 9:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses a compression mode storing portion storing a compression mode of the compressed native code on a method basis (Note Figure 3, item 318 and the corresponding sections of the disclosure), executing expansion of the compressed native code stored in said compressed native code storing portion in accordance with the compression mode (Note Figure 4, item 410 and the corresponding sections of the disclosure), and compressing the executed native code by a compression mode determined by a predetermined method as claimed (Note Figure 3, item 318 and the corresponding sections of the disclosure. A compression mode is inherently determined so that the system can compress the code properly.)

**Per claim 10:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses compressing with highest priority a native code converted first of methods stored in said native code storing portion as claimed ("the code of each loaded method...for which the predefined compression criteria is satisfied is compressed by the code compressor..." in col. 7 lines 63-65)

**Per claim 11:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses compressing a native code having a lowest execution frequency as claimed ("compresses the code of the least recently executed methods..." in col. 8 lines 54-55)

**Per claim 12:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses compressing a native code having the largest size of methods as claimed ("methods of a specific size...to be compressed" in col. 9 line 67)

**Per claim 14:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses deleting a compressed native code with a lowest execution frequency as claimed ("the least recently invoked method(s)...with compressed code are flushable and are to be flushed from the RAM..." in col. 10 lines 22-24)

**Per claim 15:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses deleting a compressed native code with a largest size of methods as claimed ("flushing criteria specifying when the loaded methods are to be flushed..." in col. 10 lines 18-19)

**Per claim 17:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses deleting a compressed native code compressed first as claimed ("method(s)...with compressed code are flushable and are to be flushed from the RAM..." in col. 10 lines 22-24)

*Claim Rejections - 35 USC § 103*

5.     The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6.      Claims 3, 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,794,049 to Lindholm, in view of "Improving Code Density Using Compression Techniques" by Lefurgy et al, hereafter referred to as Lefurgy.

**Per claim 3:**

The rejection of claim 1 is incorporated, and further, Lindholm does not explicitly disclose a prescribed unit being a series of instructions not containing branching in the program. Lefurgy discloses in an analogous code compression system a series of instructions not containing branching as claimed ("we do not compress relative branch instructions…" in section 3.2.1, page 8). As Lefurgy discloses that compression of branch instructions would affect relative branch targets thus requiring a rewrite of codewords, resulting in an NP-complete problem, it would have been obvious to one of ordinary skill in the art at the time the invention was made to not include branch instructions in the compression of Lindholm, so as to avoid an NP-complete problem as disclosed by Lefurgy.

**Per claim 13:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses compression criteria for specifying methods to be compressed (Note Figure 1, items 150, 152 and 154). Lindholm does not explicitly disclose a criteria being a highest compression ratio. Lefurgy discloses that the use of compression ratios were well known to one of ordinary skill in the art at the time the invention was

made (Note Eq. 1, page 4). It would have been obvious to one of ordinary skill in the art at the time

the invention was made to prioritize code having a highest compression ratio in the system disclosed

by Lindholm, as this would minimize the overall size of the code in the system disclosed by

Lindholm.

**Per claim 16:**

The rejection of claim 8 is incorporated, and further, Lindholm discloses deleting a compressed

native code based on criteria ("flushing criteria" in col. 10 line 20). Lindholm does not explicitly

disclose a criteria being a lowest compression ratio. Lefurgy discloses that the use of compression

ratios were well known to one of ordinary skill in the art at the time the invention was made (Note

Eq. 1, page 4). It would have been obvious to one of ordinary skill in the art at the time the

invention was made to delete code having a lowest compression ratio when running low on memory

in the system disclosed by Lindholm, as this would free up more memory space for code having a

higher compression ratio, thereby improving and minimizing code size in the system disclosed by

Lindholm.

## *Conclusion*

7.      The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure.

- **"Techniques for Obtaining High Performance in Java Programs" by Kazi et al**

  **discloses a JIT system which detects whether native code exists and is available for**

  **execution.**

- **"Java Bytecode Compression For Embedded Systems" by Clausen et al discloses a Java compression/decompression system.**

- **U.S. Patent 6,691,305 to Henkel et al discloses a code compression method for lessening the requirements imposed on main memory size.**
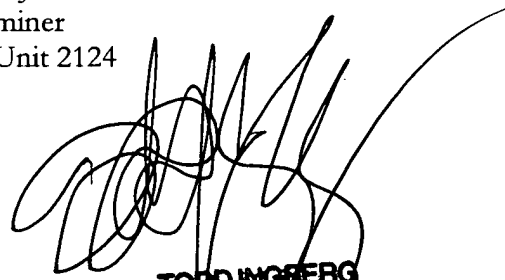
8.       Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trent J Roche whose telephone number is (571)272-3733. The examiner can normally be reached on Monday - Friday, 9:00 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (571)272-3719. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trent J Roche
Examiner
Art Unit 2124

TJR

TODD INGBERG
PRIMARY EXAMINER